One picture is worth ten thousand words.
—Chinese proverb

Treat nature in terms of the cylinder, the sphere, the cone, all in perspective.
—Paul Cézanne

Colors, like features, follow the changes of the emotions.
—Pablo Picasso

Nothing ever becomes real till it is experienced—even a proverb is no proverb to you till your life has illustrated it.
—John Keats

Objectives
In this chapter you’ll learn:

■ To understand graphics contexts and graphics objects.
■ To manipulate colors and fonts.
■ To use methods of class Graphics to draw various shapes.
■ To use methods of class Graphics2D from the Java 2D API to draw various shapes.
■ To specify Paint and Stroke characteristics of shapes displayed with Graphics2D.
Self-Review Exercises

15.1 Fill in the blanks in each of the following statements:

a) In Java 2D, method _______ of class _______ sets the characteristics of a line used to draw a shape.
ANS: setStroke, Graphics2D.

b) Class _______ helps specify the fill for a shape such that the fill gradually changes from one color to another.
ANS: GradientPaint.

c) The _______ method of class Graphics draws a line between two points.
ANS: drawLine.

d) RGB is short for _______, _______ and _______.
ANS: red, green, blue.

e) Font sizes are measured in units called _______.
ANS: points.

f) Class _______ helps specify the fill for a shape using a pattern drawn in a BufferedImage.
ANS: TexturePaint.

15.2 State whether each of the following is true or false. If false, explain why.

a) The first two arguments of Graphics method drawOval specify the center coordinate of the oval.
ANS: False. The first two arguments specify the upper-left corner of the bounding rectangle.

b) In the Java coordinate system, x-coordinates increase from left to right and y-coordinates from top to bottom.
ANS: True.

c) Graphics method fillPolygon draws a filled polygon in the current color.
ANS: True.

d) Graphics method drawArc allows negative angles.
ANS: True.

e) Graphics method getSize returns the size of the current font in centimeters.
ANS: False. Font sizes are measured in points.

f) Pixel coordinate (0, 0) is located at the exact center of the monitor.
ANS: False. The coordinate (0,0) corresponds to the upper-left corner of a GUI component on which drawing occurs.

15.3 Find the error(s) in each of the following and explain how to correct them. Assume that g is a Graphics object.

a) g.setFont( "SansSerif" );
ANS: The setFont method takes a Font object as an argument—not a String.

b) g.erase( x, y, w, h ); // clear rectangle at (x, y)
ANS: The Graphics class does not have an erase method. The clearRect method should be used.

c) Font f = new Font( "Serif", Font.BOLDITALIC, 12 );
ANS: Font.BOLDITALIC is not a valid font style. To get a bold italic font, use Font.BOLD + Font.ITALIC.

d) g.setColor( 255, 255, 0 ); // change color to yellow
ANS: Method setColor takes a Color object as an argument, not three integers.
Chapter 15  Graphics and Java 2D™: Solutions

Exercises

NOTE: Solutions to the programming exercises are located in the ch15solutions folder. Each exercise has its own folder named ex15_## where ## is a two-digit number representing the exercise number. For example, exercise 15.17’s solution is located in the folder ex15_17.

15.4  Fill in the blanks in each of the following statements:

a) Class _______ of the Java 2D API is used to draw ovals.
   ANS: Ellipse2D.

b) Methods draw and fill of class Graphics2D require an object of type _______ as their argument.
   ANS: Shape.

c) The three constants that specify font style are _______, _______ and _______.
   ANS: Font.PLAIN, Font.BOLD and Font.ITALIC.

d) Graphics2D method _______ sets the painting color for Java 2D shapes.
   ANS: setColor.

15.5  State whether each of the following is true or false. If false, explain why.

a) Graphics method drawPolygon automatically connects the endpoints of the polygon.
   ANS: True.

b) Graphics method drawLine draws a line between two points.
   ANS: True.

c) Graphics method fillArc uses degrees to specify the angle.
   ANS: True.

d) In the Java coordinate system, values on the y-axis increase from left to right.
   ANS: False. In the Java coordinate system, values on the y-axis increase from top to bottom.

e) Graphics inherits directly from class Object.
   ANS: True.

f) Graphics is an abstract class.
   ANS: True.

g) The Font class inherits directly from class Graphics.
   ANS: False. Class Font inherits directly from class Object.